

**誌**

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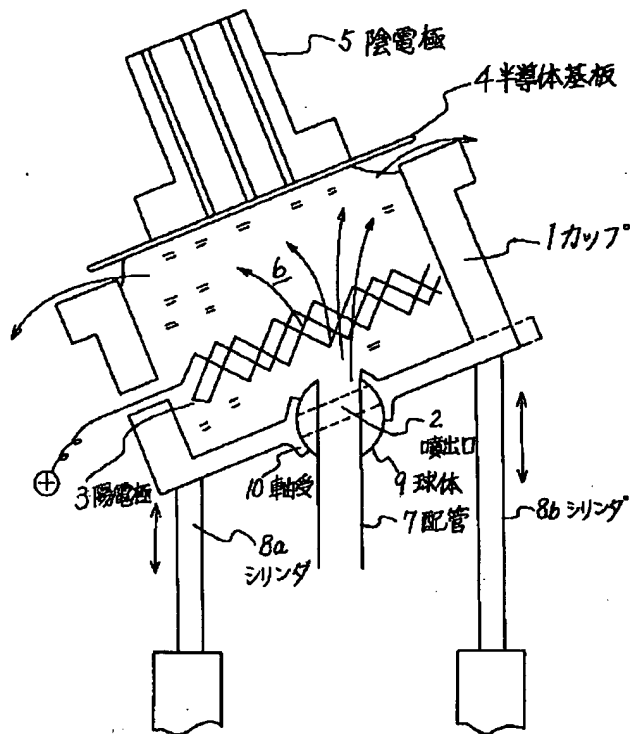
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**要約**

(57)【要約】

【目的】半導体基板の被めっき面における下地金属部に均一の厚さでめっきを施す。

【構成】半導体基板4をその開口に被せめっき液6を貯えるカップ1と、このカップ1とめっき液6を供給する配管7との継手部を施回可能な球体9を保持する軸受10と、陰電極5を回転させる機構と、カップ1の端部を上昇下降させるシリンダ8a, 8bとを設け、噴出口2における噴出流によって生ずるめっき液の盛上り部をカップ1の揺動で接触させ、半導体基板4を回転させながらめっき液を被めっき面の全面に一様に接触させる。



## 請求の範囲

### 【特許請求の範囲】

【請求項1】 上面に開口を有し底部にめっき液の噴出口をもつカップと、このカップにめっき液を前記噴出口を介して供給するめっき液供給手段と、前記カップの開口を塞ぐように半導体基板を保持するとともに回転させる陰電極とを有する金属めっき装置において、前記カップの噴出口と前記めっき液供給手段とを連結する配管に前記カップが施回し得る軸受と、前記カップを周期的に傾斜運動させる機能とを備えることを特徴とする金属めっき装置。

## 詳細な説明

### 【発明の詳細な説明】

#### 【0001】

【産業上の利用分野】本発明は、半導体基板に噴流により液面が盛上るめっき液と接触させ、半導体基板表面より露出する下地金属に金属を被着させる金属めっき装置に関する。

#### 【0002】

【従来の技術】図3は従来の金属めっき装置の一例における構成を示す模式断面図である。従来、この種の金属めっき装置は、例えば、図3に示すように、底部にめっき液を噴出させる噴出口2をもつとともに上面に開口を有するカップ1と、カップ1の開口を覆うように半導体基板4を配置し保持するとともに電源の陰極部と接続する陰電極5を有している。

【0003】この金属めっき装置を使用して、たとえばマスク膜より露呈する半導体基板4のバンプ電極に金属めっきを施す場合は、まず、半導体基板4のめっきを施す面をめっき液面に向け、陰電極5に接触させる。次に、真空吸着させて半導体基板4を陰電極に固定する。次に、めっき液を噴流ポンプで配管7を通じて噴出口2よりカップ1に供給し、カップ1にめっき液6を充たすとともに液面に噴流による盛りりを形成する。そして、このめっき液の盛りり部に半導体基板4の被めっき面に接触させ、カップ1の開口よりめっき液をオーバーフローさせる。次に、この状態で半導体基板4を回転させながら電極間に電流を流してめっきを行い半導体基板の表面に露呈するバンプ電極にめっき膜を形成する。オーバーフローしためっき液は外槽(図示せず)に一時的に貯えられ、更新され再びバンプ電極にポン

プによりカップしに供給される。

【0004】このような金属めっき装置は、めっきを施す部分のみめっき液に浸し、めっき厚を均一により早くめっきすることが出来ることから、半導体装置におけるバンプ電極形成に用いられてきた。

【0005】

【発明が解決しようとする課題】図4(a)及び(b)は噴流によるめっき液の盛上りの半導体基板の接触状態を示す図である。上述した従来の金属めっき装置では、図4に示すように、めっき液の盛上りと半導体基板の全面と接触しながら、めっきするものの、例えば、図4(a)に示すように、盛上り6aが、初期の段階あるいはポンプの変動により、めっき液が半導体基板4の周辺部と接触しなかったり、または、図4(b)に示すように電解された金属イオンが流れにより中央部における下地金属に厚く、周辺部では薄くめっきされ、めっき厚にばらつきが生ずるという問題がある。特に半導体装置においては、このめっき厚のばらつきとなり、バンプ電解とリードとの接合する際に、接続不良を引き起すことになる。

【0006】本発明の目的は、被めっき面における下地金属に均一の厚さでめっきを施すことの出来る金属めっき装置を提供することである。

【0007】

【課題を解決するための手段】本発明の金属めっき装置は、上面に開口を有し底部にめっき液の噴出口をもつカップと、このカップにめっき液を前記噴出口を介して供給するめっき液供給手段と、前記カップの開口を塞ぐように半導体基板を保持するとともに回転させる陰電極とを有する金属めっき装置において、前記カップの噴出口と前記めっき液供給手段とを連結する配管に前記カップが施回し得る軸受と、前記カップを周期的に傾斜運動させる機能とを備えている。

【0008】

【実施例】次に本発明について図面を参照して説明する。

【0009】図1は本発明の一実施例を示す金属めっき装置の模式断面図である。この金属めっき装置は、図1に示すように、カップ1の底部にある噴出口2をもつ配管7との接続構造を、配管7の失端部に球体9を取付け、この球体9に水密に保持する軸受10をカップ1の底部に取付け、カップ1を揺動させるためにカップ1の両端を交互に昇降させるシリンダ8a及び8bを設けたことである。

【0010】図2(a)及び(b)は図1のめっき装置の動作を説明するための図である。次に、このめっき装置の動作を説明する。まず、2本のシリンダ8a、8bを原位置にし、カップ1を水平状態にする(図2のI)。次に、配管7の噴出口2よりめっき液を供給し、カップ1にめっき液を貯えたとともにめっき液を盛上りを形成し、オーバフローさせる。次に、シリンダ8aを加工させる。このことよりめっき液の噴流盛上り部は、右方向に移動する(図2のII)。次に、シリンダ8aを上昇させながらシリンダ8bを下降させる。このことより、めっき液の盛上り部は紙面に対して左側へ移動する(図2のIII)。次にシリンダ8bを上昇させながらシリンダ8aを下降させカップ1を水平状態にする。勿論、このカップ1の揺動運動している間は、陰電極5は回転し、半導体基板4とめっき液との接触速度を上げている。このように初期状態IIからIへからIIIの状態を繰り返しながら、通電しめっきを行なうことで、めっき液の噴流により盛上り部の中心部分は半導体基板4の被メッキ面の一点に固定されることなく移動するので、めっき液は半導体基板4の被メッキ面に一様に接触し、金属イオンを均等に供給でき、均一なめっき膜厚で形成することが出来る。

【0011】ここで、このカップ1を揺動させる傾斜角は、形状寸法で設定されるが、めっき液の比重及び表面張力のデータから、めっき液の盛上り形状が変形しないように考慮すべきである。また、このめっき液の盛上り形状を変えるもう一つの要図として揺動速度がある。しかしこの実施例では半導体基板を回転させているところから、接触速度が十分得られるとして揺動速度を小さく、半導体基板4に全面に接触させるために傾斜角を出来るだけ大きくし、例えば30°程度とし、揺動速度は1分間に数サイクル以下が効果的であった。

【0012】

【発明の効果】以上説明した様に本発明は、半導体基板をその開口に被せめっき液を貯えるカップを揺動させる機構と、前記カップのめっき液の液面レベルを盛上げるめっき液噴流機構と、前記半導体基板を回転させる回転機構とを設け、半導体基板を回転させながらめっき液の盛上り部を移動させ被めっき面の全面に接触させることによって、被めっき面にめっき液を一様に接触させて均一なめっき厚でめっきが出来るという効果がある。

## 図の説明

### 【図面の簡単な説明】

【図1】本発明の一実施例を示す金属めっき装置の模式断面図である。

【図2】図1の金属めっき装置の動作を説明するための図である。

【図3】従来の一例を示す金属めっき装置の模式断面図である。

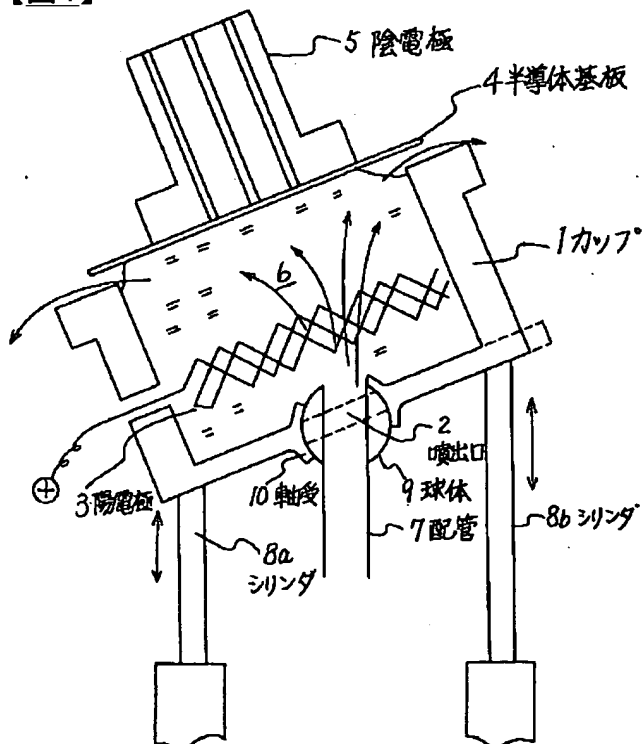
【図4】噴流によるめっき液の盛りりと半導体基板との接触状態を示す図である。

### 【符号の説明】

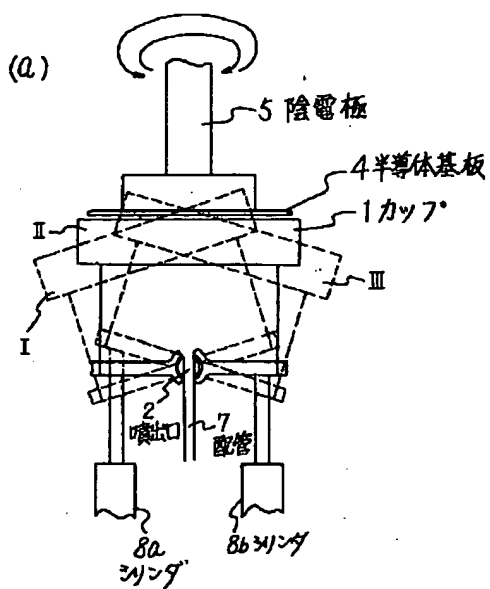
- 1 カップ
- 2 噴出口
- 3 陽電極
- 4 半導体基板
- 5 陰電極
- 6 めっき液
- 6a, 6b 盛りり
- 7 配管
- 8a, 8b シリンダ
- 9 球体
- 10 軸受

## 図面

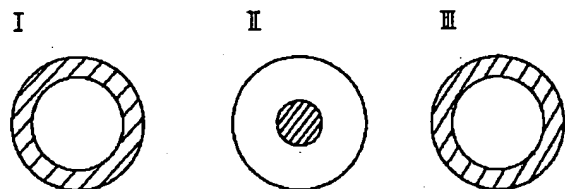
### 【図1】



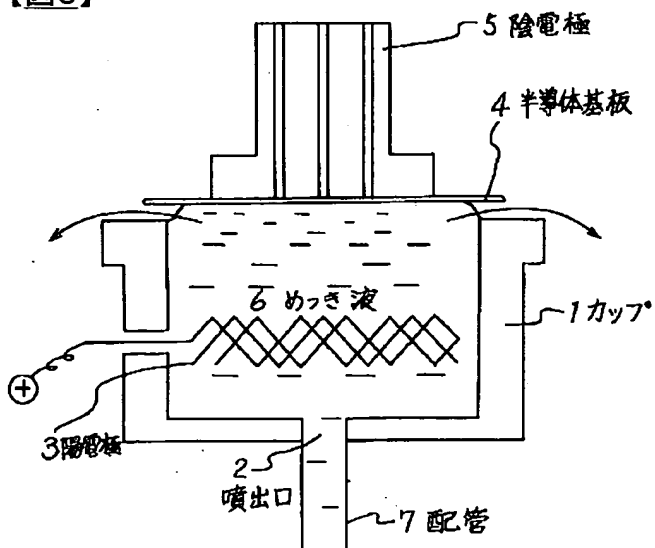
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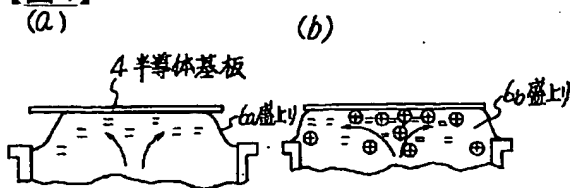
(b)



【図3】



【図4】





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**Bibliography.**

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- (54) [Title of the Invention] Metal plating equipment.
- (51) [The 5th edition of International Patent Classification]

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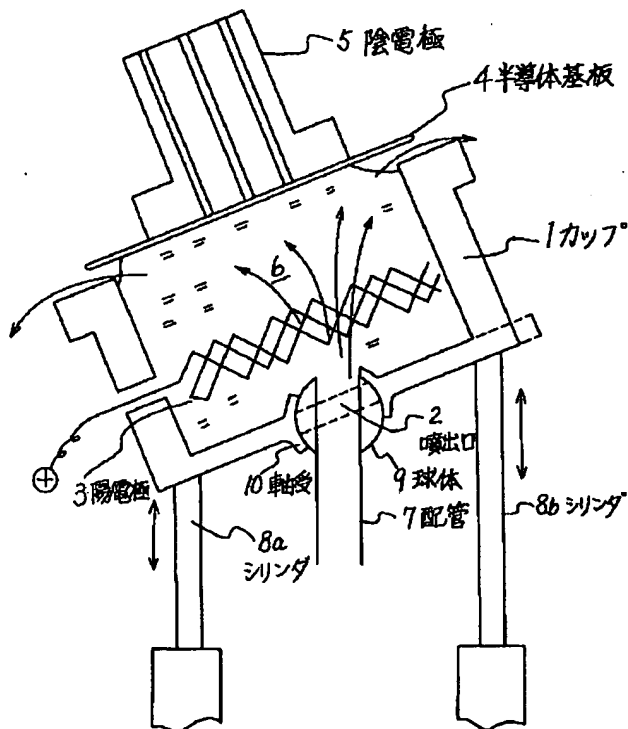
## Summary.

## (57) [Abstract]

[Objects of the Invention] It galvanizes by uniform thickness in the ground metal section in the galvanized field of a semiconductor substrate.

[Elements of the Invention] the joint section of the cup 1 in which the semiconductor substrate 4 is put on the opening, and plating liquid 6 is stored, and this cup 1 and the piping 7 which supplies plating liquid 6 — the sphere in which \*\*\*\* is possible — with the bearing 10 holding 9 The mechanism in which a cathode 5 is rotated, and the cylinders 8a and 8b which carry out the rise descent of the edge of a cup 1 are formed. The climax section of the plating liquid produced by the flush in an exhaust nozzle 2 is contacted by rocking of a cup 1, and plating liquid is uniformly contacted all over a galvanized field, rotating the semiconductor substrate 4.

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## CLAIMS

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[Claim(s)]

[Claim 1] Metal plating equipment which has the cup which is characterized by providing the following, and which has opening on the upper surface and has the exhaust nozzle of plating liquid in a pars basilaris ossis occipitalis, a plating liquid supply means to supply plating liquid to this cup through the aforementioned exhaust nozzle, and the cathode which makes it rotate while holding a semiconductor substrate so that opening of the aforementioned cup may be plugged up. Bearing which the aforementioned cup may \*\*\*\* for piping which connects the exhaust nozzle of the aforementioned cup, and the aforementioned plating liquid supply means. The function to which titing of the aforementioned cup is carried out periodically.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention is contacted in the plating liquid to which an oil level rises by the jet to a semiconductor substrate, and relates to the metal plating equipment which makes a metal put on the ground metal exposed from a semiconductor substrate front face.

[0002]

[Description of the Prior Art] Drawing 3 is the type section view showing the composition in an example of conventional metal plating equipment. opening of the cup 1 from which both metal plating equipments of this kind have opening for the exhaust nozzle 2 which makes plating liquid blow off at the pars basilaris ossis occipitalis on the upper surface conventionally as shown in drawing 3 , and a cup 1 -- \*\*\*\* -- while arranging and holding the semiconductor substrate 4 like, it has the \*\*\*\* electrode 5 linked to the cathode section of a power supply

[0003] When performing metal plating to the bump electrode of the semiconductor substrate 4 which uses this metal plating equipment, for example, is exposed from a mask film, the field which galvanizes the semiconductor substrate 4 is first turned to a plating oil level, and a cathode 5 is made to contact. Next, vacuum adsorption is carried out and the semiconductor substrate 4 is fixed to a cathode. Next, plating liquid is supplied to a cup 1 from an exhaust nozzle 2 through piping 7 by the jet pump, and while filling plating liquid 6 in a cup 1, climax by \*\*\*\* is formed in an oil level. And the galvanized field of the semiconductor substrate 4 is contacted in the climax section of this plating liquid, and plating liquid is made to overflow from opening of a cup 1. Next, a plating film is

formed in the bump electrode which passes current to inter-electrode, galvanizes and is exposed on the front face of a semiconductor substrate, rotating the semiconductor substrate 4 in this state. Overflowing plating liquid is temporarily stored in an outside tub (not shown), is updated, and is again supplied for carrying out a cup to a bump electrode with a pump.

[0004] Since such metal plating equipment can dip only the portion which galvanizes in plating liquid and can galvanize plating thickness early more uniformly, it has been used for the bump electrode formation in a semiconductor device.

[0005]

[Problem(s) to be Solved by the Invention] Drawing 4 (a) and (b) are drawings showing the contact state of the semiconductor substrate of climax of the plating liquid by the jet. Although it galvanizes with the conventional metal plating equipment mentioned above, contacting climax of plating liquid and the whole surface of a semiconductor substrate as shown in drawing 4, as shown in drawing 4 (a), for example By the early stage or change of a pump, plating liquid does not contact the periphery of the semiconductor substrate 4, or climax 6a Or by the flow, the metal ion electrolyzed as shown in drawing 4 (b) is thick to the ground metal in a center section, and is thinly galvanized by the periphery, and there is a problem that dispersion arises in plating thickness. Especially in a semiconductor device, it becomes dispersion in this plating thickness, and in case [ of bump electrolysis and a lead ] it joins, a faulty connection will be caused.

[0006] the purpose of this invention galvanizes by uniform thickness to the ground metal in a galvanized field -- this -- \*\* -- it is offering the metal plating equipment which can be done

[0007]

[Means for Solving the Problem] The cup which the metal plating equipment of this invention has opening on the upper surface, and has the exhaust nozzle of plating liquid in a pars basilaris ossis occipitalis. In the metal plating equipment which has a plating liquid supply means to supply plating liquid to this cup through the aforementioned exhaust nozzle, and the cathode which makes it rotate while holding a semiconductor substrate so that opening of the aforementioned cup may be plugged up Piping which connects the exhaust nozzle of the aforementioned cup and the aforementioned plating liquid supply means is equipped with the bearing which the aforementioned cup may \*\*\*\*, and the function to which titing of the aforementioned cup is carried out periodically.

[0008]

[Example] Next, this invention is explained with reference to a drawing.

[0009] Drawing 1 is the type section view of the metal plating equipment in which one example of this invention is shown. connection structure with the piping 7 which has the exhaust nozzle 2 in the pars basilaris ossis occipitalis of a cup 1 as this metal plating equipment is shown in drawing 1 --

\*\*\*\*\* of piping 7 -- a sphere -- in order to attach 9, to attach in the pars basilaris ossis occipitalis of a cup 1 the bearing 10 held watertight to this sphere 9 and to make a cup 1 rock, it is having formed the cylinders 8a and 8b which make it go up and down the ends of a cup 1 by turns

[0010] Drawing 2 (a) and (b) are drawings for explaining operation of the plating equipment of drawing 1. Next, operation of this plating equipment is explained. First, two cylinders 8a and 8b are made into a original position, and a cup 1 is changed into a level state (II of drawing 2). Next, while supplying plating liquid and storing plating liquid in a cup 1 from the exhaust nozzle 2 of piping 7, climax is formed and plating liquid is made to overflow. Next, cylinder 8a is made to process it. The jet climax section of plating liquid moves rightward from this (I of drawing 2). Next, cylinder 8b is dropped, raising cylinder 8a. From this, the climax section of plating liquid moves to left-hand side to space (III of drawing 2). Next, raising cylinder 8b, cylinder 8a is dropped and a cup 1 is changed into a level state. Of course, while this cup 1 is carrying out rocking movement, a cathode 5 rotates and is gathering the contact speed of the semiconductor substrate 4 and plating liquid. Thus, since it moves without rising by the jet of plating liquid by energizing repeating the state of I to III from an initial state II to 1, and galvanizing, and fixing a part for the core of the section to one point of the field plated [ of the semiconductor substrate 4 ], it can contact uniformly [ plating liquid ] to the

field plated [ of the semiconductor substrate 4 ], and a metal ion can be supplied equally, and it can form by uniform plating thickness.

[0011] Here, the tilt angle which makes this cup 1 rock is \*\*\*\*\* which should be considered as the climax configuration of plating liquid not deforming from the specific gravity of plating liquid, and the data of surface tension although set up by the geometry. Moreover, there is rocking speed as another cartographical sketching which changes the climax configuration of this plating liquid. However, from the place which is rotating the semiconductor substrate in this example, in order are small and to contact rocking speed to the semiconductor substrate 4 on the whole surface noting that contact speed is obtained enough, the tilt angle was enlarged as much as possible, for example, it considered as about 30 degrees, and below the number cycle of rocking speed was effective in 1 minute.

[0012]

[Effect of the Invention] The mechanism in which the cup in which this invention puts a semiconductor substrate on the opening, and plating liquid is stored as explained above is made to rock, By moving the climax section of plating liquid and making it contact all over a galvanized field, establishing the plating liquid jet mechanism which heaps up the oil-level level of the plating liquid of the aforementioned cup, and the rolling mechanism which rotates the aforementioned semiconductor substrate, and rotating a semiconductor substrate It is effective in contacting plating liquid uniformly and being made by plating in uniform plating thickness in a galvanized field.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the type section view of the metal plating equipment in which one example of this invention is shown.

[Drawing 2] It is drawing for explaining operation of the metal plating equipment of drawing 1 .

[Drawing 3] It is the type section view of the metal plating equipment in which a conventional example is shown.

[Drawing 4] It is drawing showing the contact state of the climax and the semiconductor substrate of plating liquid by the jet.

[Description of Notations]

1 Cup

2 Exhaust Nozzle

3 Positive Electrode

4 Semiconductor Substrate

5 Cathode

6 Plating Liquid

6a, 6b Climax  
 7 Piping  
 8a, 8b Cylinder  
 9 Sphere  
 10 Bearing

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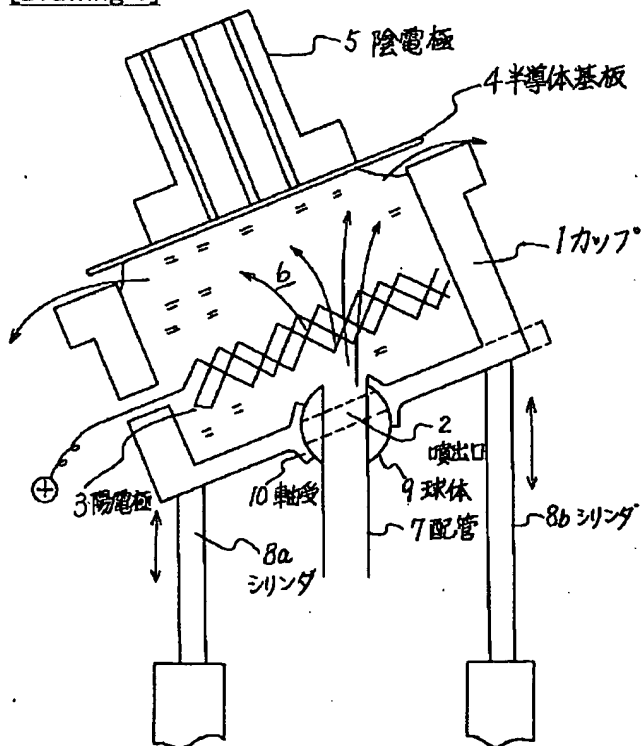
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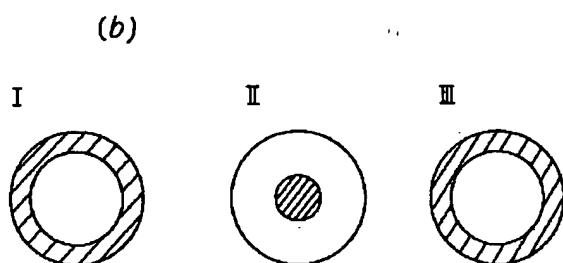
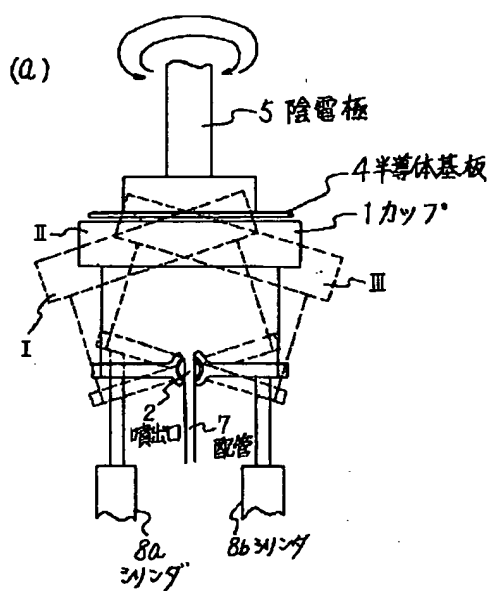
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3. In the drawings, any words are not translated.

DRAWINGS

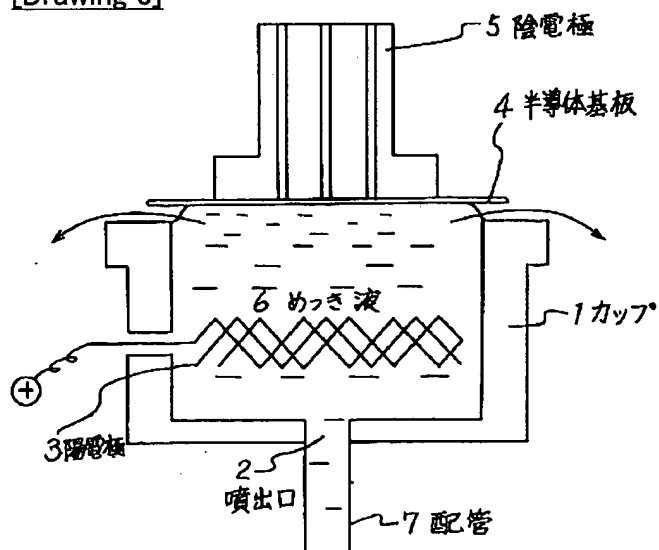
[Drawing 1]



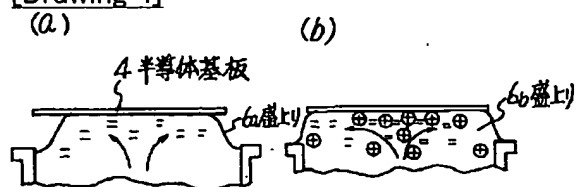
[Drawing 2]



**[Drawing 3]**



[Drawing 4]



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[Translation done.]